

A review about Previn® (Diphotérine®)

A solution for first aid emergency decontamination of eye/skin chemical splashes

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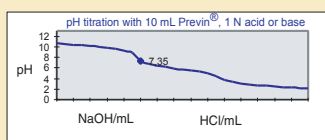
Introduction

First aid in chemical splashes¹ should consist in emergency rinsing of eye or skin to remove the corrosive substance and prevent its penetration into the tissues². To achieve this, polyvalent binding and stopping of acid/basic/oxido-reductive reactions in the tissue is required. This study presents Previn® (German version of Diphotérine®) as an eye/skin decontamination solution. Its chemical³ and physical⁴ properties like chelation and neutralization in acid and basic pH allow a quasi polyvalent rinsing of chemical splashes with a quick return to a physiological state. Previn® stops the penetration of the chemical product^{1,2}. This is due to its hyperosmolarity. three experiments were performed. the first one was performed to prove the compatibility of Previn's high osmolarity components with the human eye. The second experiment tested the neutralization-capacity of Previn® in vivo in rabbit eyes after alkali eye burn. In a third step, Previn®'s efficacy was tested in an epidemiological study.

Materials and methods

Previn® is a non toxic solution (Oral Toxicity LD₅₀>2000 mg/Kg, Test 990479 ST, CERB, France, 1999). It is non irritant on the eye (test 133/1, Safepharm Laboratories, UK, 1987) and non irritant on the skin (test 133/2, Safepharm Laboratories, UK, 1987).

Rinsing solution	Osmolarity (mOsmol/kg)
Water	0
Ringer-Lactat	
Phosphate buffer	ca. 270
NaCl 0.9%	
Previn	884
Healthy cornea	345
Burned cornea	1370



1. INNOCIVITY OF PREVIN® IN HEALTHY HUMAN SUBJECTS

- 10 healthy human subjects age 31 (+/- 4.5 years)
- solutions : phosphate buffer, Previn®
- examination : visual acuity, slit lamp examination, confocal microscopy of the cornea (Wild-Leitz flying-slit), tonometry (Goldmann) before, immediately after the rinsing and after 3 days.
- rinsing : 500 mL of 20°C solution over five minutes.

2. pH MEASUREMENTS IN VIVO

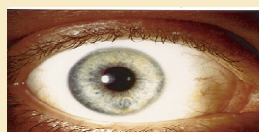
- 3 groups of 8 rabbits
- 3 rinsing solutions : phosphate buffer, saline solution (0.9%), Previn®
- 1N NaOH for 30 seconds in a 12 mm diameter plexiglas ring
- prompt irrigation with 250 mL of the three solutions
- pH-measurements for the corneal surface and the aqueous humour

3. EPIDEMIOLOGICAL RESULTS WITH THE USE OF PREVIN®

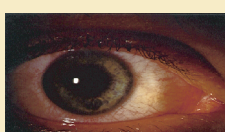
The Medical and Health and Safety Services of the Mannesmann and Martinswerk factories have introduced Previn® for the rinsing of chemical splashes. The previous protocol for the rinsing was water or specific neutralizing solution and did not achieve good results concerning the need of secondary care, the appearance of sequelae and the days lost from work. The new protocol of rinsing with Previn® is the following : Each ocular or cutaneous chemical splash has to be rinsed in emergency (some seconds to a few minutes) with Previn®, on location, whilst undressing if necessary. Then each person went to the medical centre for an examination, where in the case of the MANNESMANN company, a secondary rinsing with Previn® was performed in the medical centre. For eye splashes, Sterilized Individual Eye Wash (SIEW) of 50 mL was used within 10 seconds while 500 mL of Previn® was used for a longer time of contact (about a minute). For small skin splashes, such as a hand or a face, a spray of 100 or 200 mL of Previn® was used depending on the time of contact and the area. A large skin splash such as a leg or the chest involved the use of an Autonomous Portable Shower (DAP) with 5L of Previn® in the minute following the accident.

Results

1. INNOCIVITY⁵ OF PREVIN® IN HEALTHY HUMAN SUBJECTS



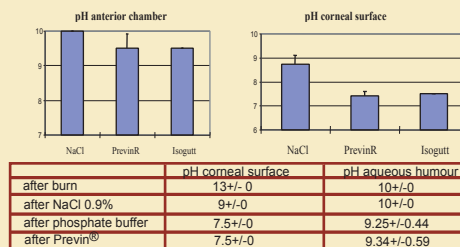
Conjunctival hyperemia after the rinsing with phosphate buffer



Visual acuity was diminished after irrigation with both kind of solution (2/5 and 3/5). It returned to normal after the third day after irrigation. Conjunctival hyperemia was significantly increased and pronounced after rinsing with phosphate buffer (2/5 against 0/5 for Previn®). Confocal microscopy showed an increased tear film and a number of wing cells in the epithelium after irrigation with both solution. This returned to normal after 3 days.

2. pH MEASUREMENTS IN VIVO

A pH-decrease was observed after the rinsing with Previn® and phosphate buffer. No statistical difference in the neutralization effect was measured for these solutions.



3. EPIDEMIOLOGICAL RESULTS

CASE REPORTS : corrosive splashes

rinsed with Previn®			
year	Factory	Exposure	Body surface
1999	Knoll AG	96% sulfuric acid	check
1998	Giesecke&Debrient	100% nitric acid	hand
1995	Metaleurop	96% sulfuric acid	face+neck
1993	Mewa	50% sodium hydroxide	forearm

Results : no SEQUELAE, no secondary care, no loss of work

A SERIE⁶ OF 24 CHEMICAL SPLASHES

rinsed with Previn®
in the MANNESMANN factory, in Germany, 1994-1998

Exposure	Cutaneous splashes	Ocular splashes
Acids*	8	11
Bases**	1	4

*acids : sulfuric acid, nitric acid, phosphoric acid or sulfamic acid, alone or in mixture with the other acids, with a concentration of 5 to 100%.

**bases : calcium oxide, 30-45% sodium hydroxide, 30% basic solution

Results : no DAMAGE, no secondary care, no loss of work
excepted two accidents with one day lost from time

A STATISTICAL STUDY⁷ ABOUT 42 SODIUM HYDROXIDE (40-600 g/L) SPLASHES

rinsed with different rinsing solutions
in the MARTINSWERK factory, Germany, 1991-1993

	Previn®	Acetic acid	Water
Loss of work	0,18d ± 0,4	2,91d ± 4,3	8d ± 8,12
No care	100% ± 15%	0 ± 15%	0 ± 15%
Simple care	0 ± 15%	80% ± 15%	25% ± 15%
Medical care	0 ± 15%	20% ± 15%	75% ± 15%

Results : Using Previn® resulted in a noticeable decrease in sick leave average and a standard deviation. No secondary care was necessary. There is a significant difference (p<0.05) between Previn® and water concerning secondary care and loss of work.

Conclusion

The emergency use of Previn® is efficient in decontamination of ocular and cutaneous splashes. It is innocuous to the human eye. Although, it is highly hyperosmolar to the cornea, it is very well tolerated. Neutralization of corrosives stops the biological damage. A reduction of time off work and secondary care in all cases is achieved, sequelae are avoided.

References

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